Managing Storm Water in Wisconsin: A Local Partnership Protects the Kinnickinnic River

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Setting:

Some of the best trout fishing in the Midwest can be found in St. Croix County, one of the fastest-growing counties in Wisconsin. The City of River Falls, located on the southern edge of St. Croix County and in the heart of the Kinnickinnic River Watershed (Map 1), is home to 12,000 people. Because of its close proximity to the major metropolitan area of Minneapolis-St. Paul, MN, River Falls is a rapidly growing community, with a 20% population increase during the past decade. Growth estimates project a population of 16,500 by the year 2010 (Ayres and Associates, 1987). This estimate may be conservative, however, since it does not include growth in the surrounding townships, where agricultural lands are rapidly being converted to rural residential uses (SEH, 1995).

The Kinnickinnic River, a state "outstanding resource water", flows through River Falls in west-central Wisconsin. A premiere trout stream, the "Kinni" is renowned for its dense populations of wild brown trout. Approximately 2,000-8,000 trout per mile reside in the river, with no stocking needed to sustain this naturally reproducing fishery. According to fisheries biologists, a trout population of 1,000 fish per mile is considered excellent.

Scientific Assessment of Local Storm Water Impacts:

The Kinnickinnic River is a valuable cold-water resource representing a major natural amenity of the River Falls community. Although trout populations in the river are currently high, the effect of growth in the City of River Falls and surrounding townships has the potential to degrade the physical, chemical, and biological characteristics of the Kinnickinnic River and its tributaries. As growth occurs, the creation of impervious surfaces like roofs, sidewalks, driveways, streets, and parking lots generates a substantial amount of storm water runoff that can significantly affect a river. Storm water impacts include higher stream flows, thermal pollution, chemical pollution, and sedimentation (Schueler, 1994), all of which pose threats to aquatic habitat, trout, and other cold-water organisms.

<u>Biological and Habitat Impacts</u>

In the early 1990s, the local Kiap-TU-Wish Chapter of Trout Unlimited (Kiap-TU-Wish) and the Wisconsin Department of Natural Resources (WDNR) began noting differences in trout populations and habitat quality in the Kinnickinnic River, above and below the City of River Falls. Likely due to storm water runoff, trout populations were significantly lower and stream bank erosion was increasing downstream from River Falls. Thermal impacts were also suspected.

Thermal Impacts

In response to the concern about thermal pollution, Kiap-TU-Wish established a temperature monitoring network in 1992, at four locations on the Kinnickinnic River (Map 2) and two locations on major tributaries. With funding provided by Kiap-TU-Wish and the Wisconsin Council of Trout Unlimited, Ryan TempMentor® data-logging thermometers were purchased and installed at river locations upstream and downstream from City of River Falls storm water discharges and two local hydropower dams. The data logging thermometers record river temperatures at 10-minute intervals during the April-September period, thereby documenting any thermal impacts associated with storm water runoff during summer rains. Significant thermal impacts have been apparent downstream from River Falls storm water discharges and hydropower dams. Rapid increases in river temperature (up to 10 degrees Fahrenheit) are frequently evident at locations downstream from storm water discharges during summer rainfalls (Figures 1 and 2), and storm water temperatures may exceed 78 degrees Fahrenheit (Figures 3 and 4), the upper lethal limit for brown trout. The thermal impact of the two city hydropower dams produces downstream temperatures that are at least 3-6 degrees Fahrenheit warmer than upstream temperatures during the summer months (Figure 5). Conversely, downstream temperatures are significantly cooler during the winter months, with possible impacts on incubating eggs in the trout redds.

Sediment and Nutrient Impacts

To evaluate the possible impacts of sediment and other urban pollutants in River Falls storm water runoff, storm event-based composite sampling of residential, commercial, and industrial areas of River Falls was conducted in 1992 by Short Elliott Hendrickson (SEH), a local water resources management firm (SEH, 1995). A comparison of River Falls monitoring results to EPA (1983) NURP monitoring results (Table 1) indicates that sediment and nutrients are of particular concern in River Falls storm water runoff, with total suspended solids, total Kjeldahl nitrogen, and total phosphorus concentrations substantially higher than the NURP median concentrations.

Using Scientific Assessment Information to Initiate and Support Storm Water Planning and Management Efforts:

One of the goals of the Kiap-TU-Wish temperature monitoring project was to obtain sound scientific information on the local impacts of storm water runoff. Using this monitoring information, Kiap-TU-Wish initiated a discussion with River Falls planners and policy-makers about the need for storm water management tools that would enable the city to grow while protecting the Kinni.

Leveraging the Ideas and Resources of Local Partners:

City of River Falls Storm Water Management Plan

In 1993, the City of River Falls, through the WDNR, applied for and received federal 205J funding to develop a storm water management plan. Short Elliott Hendrickson (SEH) was selected by the city to prepare the plan, in partnership with Kiap-TU-Wish, local townships, the WDNR, the Kinnickinnic River Land Trust, and the University of Wisconsin-River Falls. The "City of River Falls Water Management Plan for the Kinnickinnic River and Its Tributaries" (Figure 6) was completed in 1994, at a cost of $115,000, with a portion of the funding provided by the city and Kiap-TU-Wish. The plan, adopted by the River Falls City Council in April 1994, provides a "blueprint" for the city's storm water management efforts to protect the Kinnickinnic River as the city grows (SEH, 1995).

Shortly after adoption of the storm water management plan, the City of River Falls established a storm water utility to generate funding for storm water management projects that protect and enhance the Kinnickinnic River. The storm water utility charges a fee to city residents and businesses according to the amount of storm water running off a property. As an incentive to residents and businesses that reduce the amount of storm water runoff from their properties, the City of River Falls reduces their annual storm water utility fee proportionately.

In 2002, River Falls adopted a storm water management ordinance (Figure 7). The ordinance, prepared with input from the partners, is another key element of the city's storm water management plan, and requires all developers to use storm water management practices that entirely infiltrate the first 1.5 inches of runoff from all storm events. Among the options for developers is the low impact development approach, which uses biotechnology (rain gardens, swales, constructed wetlands, and buffers of native vegetation) to distribute and infiltrate storm water across the landscape, rather than concentrating and conveying it to the river with conventional storm water infrastructure (curb and gutter, storm sewers, and detention ponds).

Kinnickinnic River Priority Watershed Project

In 1995, efforts to protect the Kinnickinnic River expanded watershed-wide when the WDNR selected the Kinnickinnic River as a part of the state's Priority Watershed Program. The Priority Watershed Program provides annual funding, over a ten-year period, for cost-shared projects in both agricultural and urban areas of the watershed that protect and enhance the quality of the Kinnickinnic River. Prior to receiving state funding, however, a watershed plan had to be developed so that the state and local cost-share funding could be appropriately directed to areas of the watershed in greatest need of agricultural and urban best management practices (BMPs). The WDNR worked in partnership with Kiap-TU-Wish, two counties, six townships, three cities (including River Falls), the University of Wisconsin-River Falls, the Kinnickinnic River Land Trust, and SEH to develop the "Nonpoint Source Control Plan for the Kinnickinnic River

Priority Watershed Project" (WDNR, 1999) (Figure 8), which was approved by the Wisconsin Natural Resources Board in April 1999. The plan is unique in that it is among the first priority watershed plans in the state to incorporate an urban storm water management component, applying the approach used in the City of River Falls storm water management plan to other cities and townships across the watershed. A list of eligible agricultural and urban BMPs and associated cost-share rates is presented in Table 2.

Local Environmental Education is Important:

In 1998, recognizing the need for an educational tool that can be used to protect cold-water resources in urbanizing areas, Kiap-TU-Wish, in partnership with Palisade Productions of Minneapolis, MN, produced a video entitled: "A Storm on the Horizon" (Figure 9 and display). Using the Kinnickinnic River as the backdrop, this 15-minute video describes the value of a cold-water resource, discusses the potential threats posed to cold-water resources by urban growth, and also describes some tools available to communities for protecting these resources while accommodating growth. The video won a Silver Screen Award in the "Environmental Issues and Concerns" category at the Chicago International Film Festival in 1999. Kiap-TU-Wish members have distributed nearly 3,000 copies of the video nationwide, to local planners and policy-makers, engineers, scientists, elementary, middle school, high school, and college educators and students, nonprofit organizations, and other Trout Unlimited members and chapters.

Translating a Storm Water Plan to Action in River Falls:

In 2000, the City of River Falls and the River Falls School District took advantage of an opportunity to implement some of the new storm water management techniques described in the city's storm water management plan. The school district was planning to build a new high school near the South Fork of the Kinnickinnic River, a tributary to the main river. After learning that a preliminary site plan had already been designed for the new high school, several Kiap-TU-Wish members showed "A Storm on the Horizon" to school officials and city planners, and stressed the need for good storm water management practices on the site. Kiap-TU-Wish members, the City of River Falls, SEH, and Kinnickinnic River Priority Watershed Project participants worked with the school district's landscape architect to redesign the site. A large, expansive parking lot in the original design was changed to smaller, separated lots buffered with native vegetation that infiltrates storm water runoff from these impervious surfaces. Native buffers were also established between the athletic fields, to trap soil and nutrients. Three storm water detention ponds on the site contain and infiltrate excess runoff, including the runoff from the building roof. With funding provided by the Priority Watershed Project, an innovative irrigation system was also installed to pump storm water from the detention ponds to the athletic fields. As originally designed, the new high school site would have cost the River Falls School District $8,000 per year in storm water utility fees paid to the City of River Falls. With the redesign work, it is anticipated that no storm water will leave the site, saving the school district $8,000 per year while protecting the South Fork and Kinnickinnic River. With completion of the new high school in the fall of 2001, Kiap-TU-Wish members and Kinnickinnic River Priority Watershed Project participants plan to help the school district install interpretive signs that explain the various storm water management components of the site. It is hoped that these components can be incorporated into the educational curriculum at the high school. Funding for the signage will also be provided by the Priority Watershed Project.

The Benefits of Effective Storm Water Management:

Trout are an important indicator species of environmental quality, especially in an urbanizing area. As such, protection of the Kinnickinnic River is critical to help ensure the environmental, cultural, and economic future of River Falls and surrounding communities. With nearly 200 members, the Kiap-TU-Wish Chapter of Trout Unlimited has been instrumental in protecting the Kinnickinnic River during the past decade. The chapter has raised the awareness of planners, policy-makers, and residents with regard to storm water issues, and has helped to change the way River Falls manages an outstanding cold-water resource in Wisconsin, thereby ensuring that the Kinni will be available for the enjoyment of future generations.

For more information, please contact:

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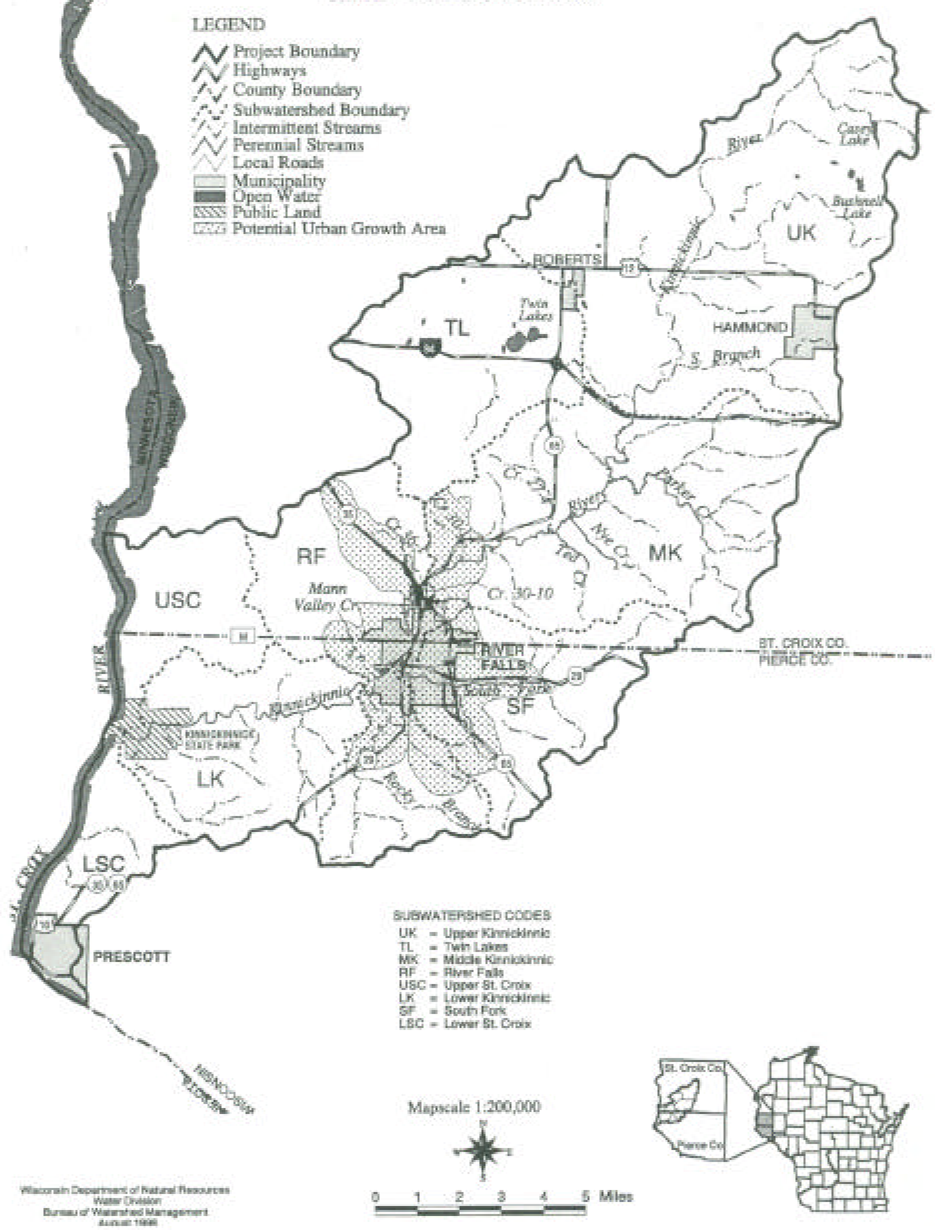
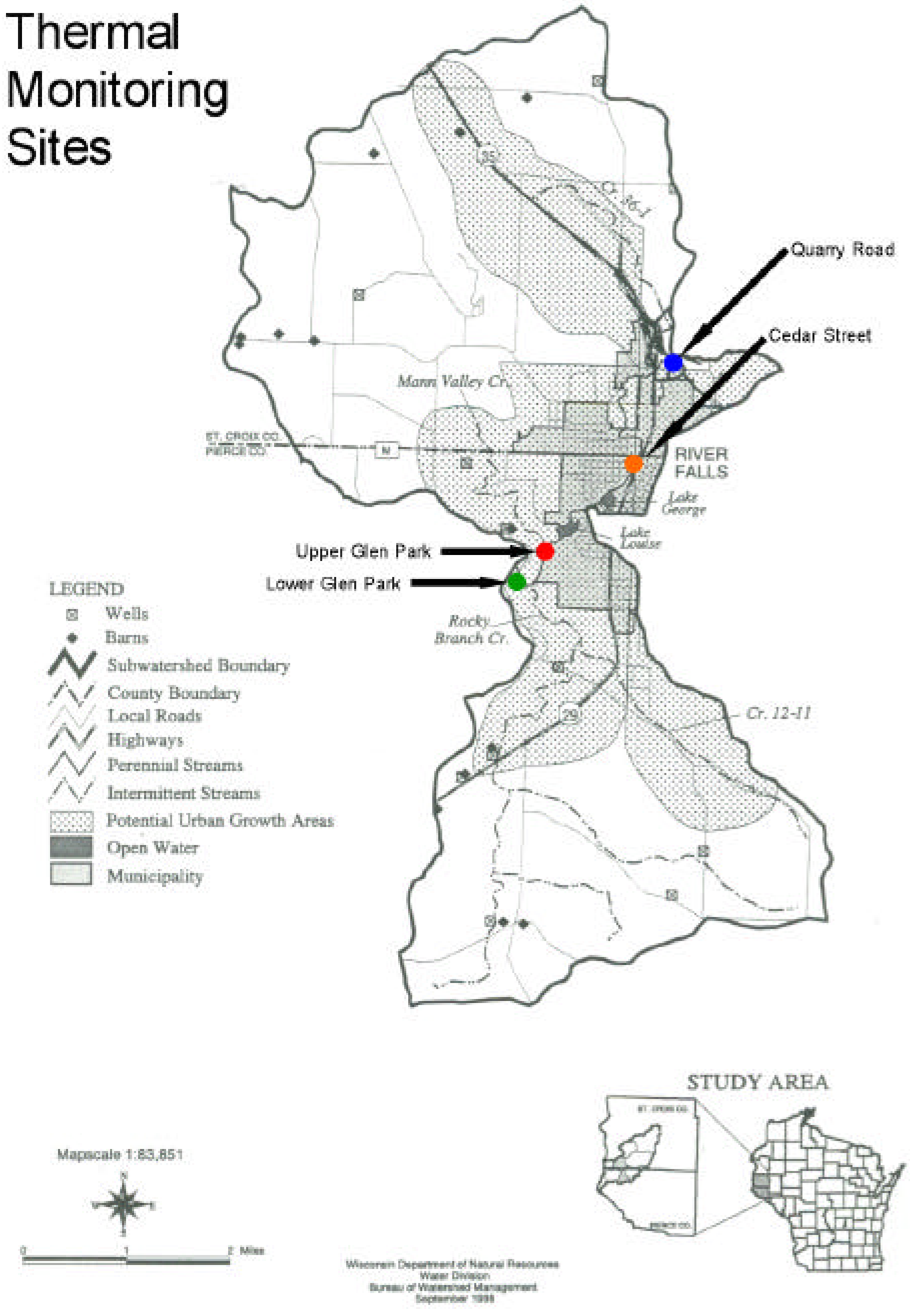
Kiap-TU-Wish Website: http://www.lambcom.net/kiaptuwish/

Map 1 Kinnickinnic River Subwatersheds and Tributaries



Map 2 River Falls Subwatershed



Map 2 Additional Information on the Kinnickinnic River Thermal Monitoring Sites:

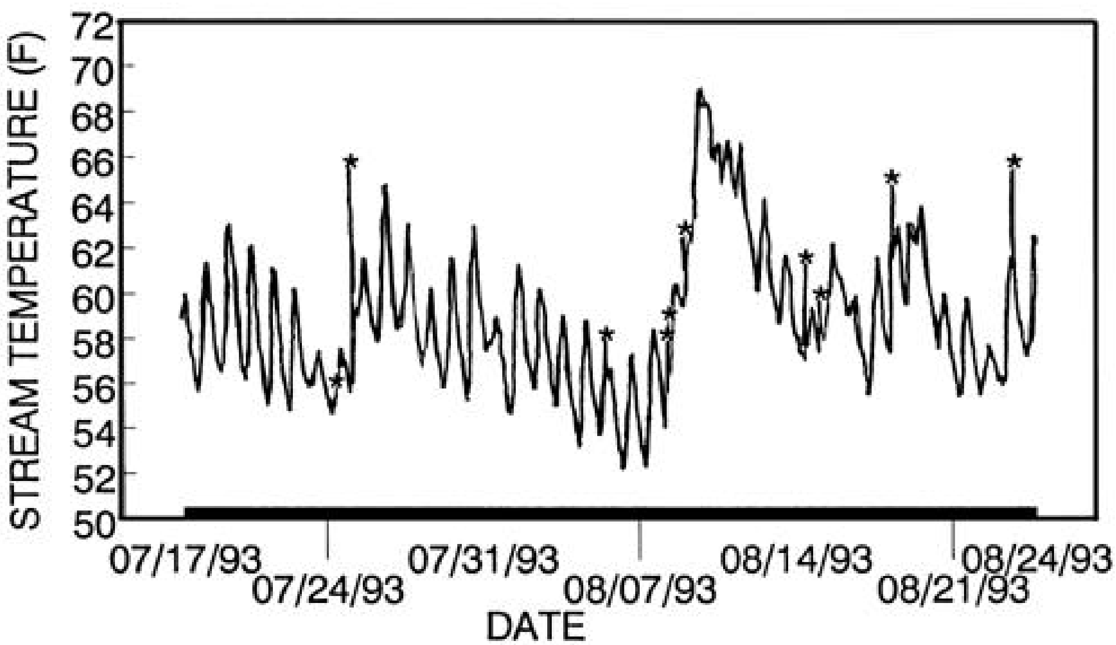
Quarry Road: The Quarry Road site is located along Quarry Road in the River Falls Subwatershed, at the upper (NE) River Falls city limit. This upstream location is unaffected by River Falls storm water discharges and the two city hydropower impoundments (Lake George and Lake Louise).

Cedar Street: The Cedar Street site is located near the former Cedar Street Bridge in the River Falls Subwatershed. This urban location is immediately downstream from four direct storm water discharges draining residential and commercial areas of River Falls. The site is also immediately upstream from Lake George and Lake Louise.

Upper Glen Park: The Upper Glen Park site is located in the upper part of Glen Park in the River Falls Subwatershed. This location is approximately 0.1 mile downstream from a large storm water discharge (Bartosh Canyon) draining a residential area of River Falls. The site is also 0.1 mile downstream from Lake George and Lake Louise.

Lower Glen Park: The Lower Glen Park site is located in the lower part of Glen Park in the River Falls Subwatershed, at the lower (WSW) River Falls city limit. This location is approximately 0.9 mile downstream from Bartosh Canyon and the two impoundments. The site is also 0.2 mile downstream from the Rocky Branch tributary.

Figure 1 Cedar Street Thermograph With Storm Water-Induced Temperature Spikes (*), July-August 1993



Stream Temperature Summary: Average= 58.8 F Minimum= 52.3 F Maximum= 69.1

*= Rain Event

Figure 2 Cedar Street Thermograph With Storm Water-Induced Temperature Spike July 25, 1993

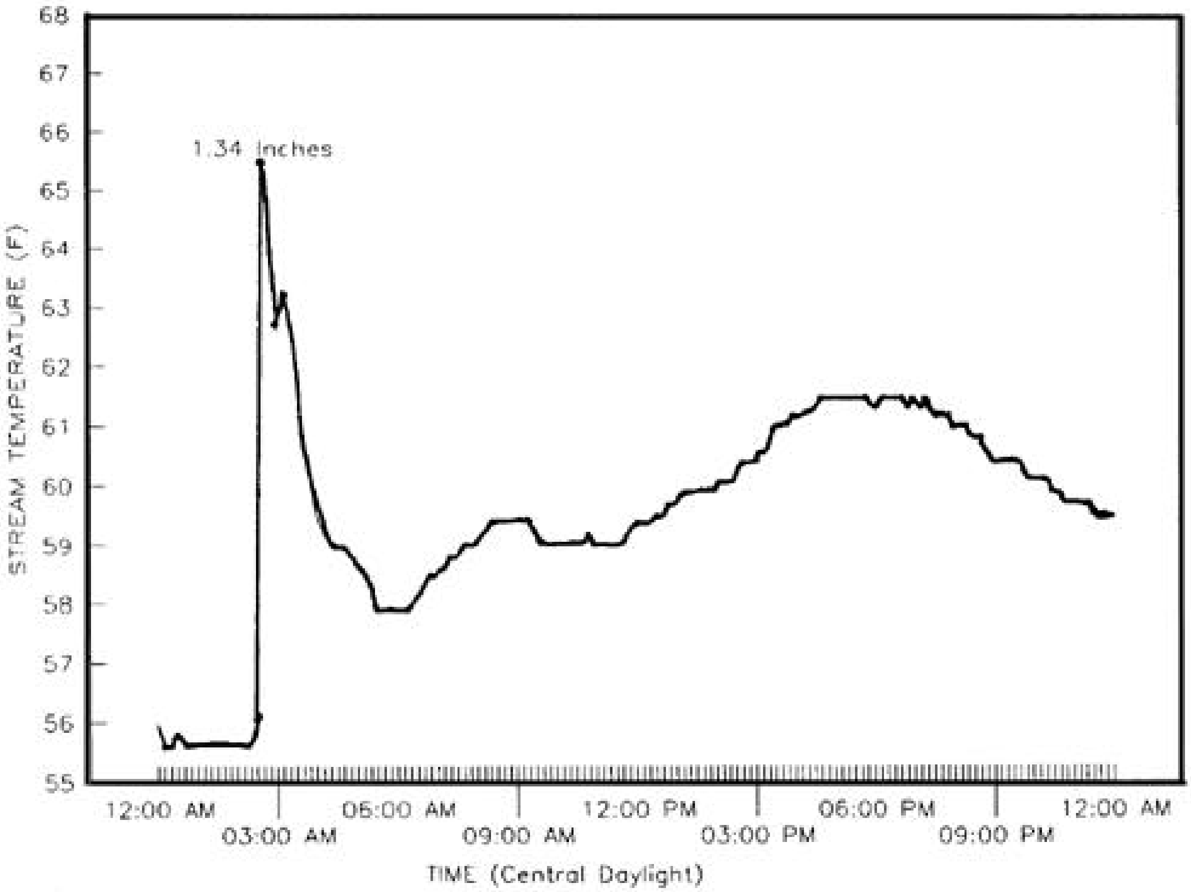


Figure 3 Storm Water Temperatures (*) in a Commercial River Falls Subwatershed, June 1992

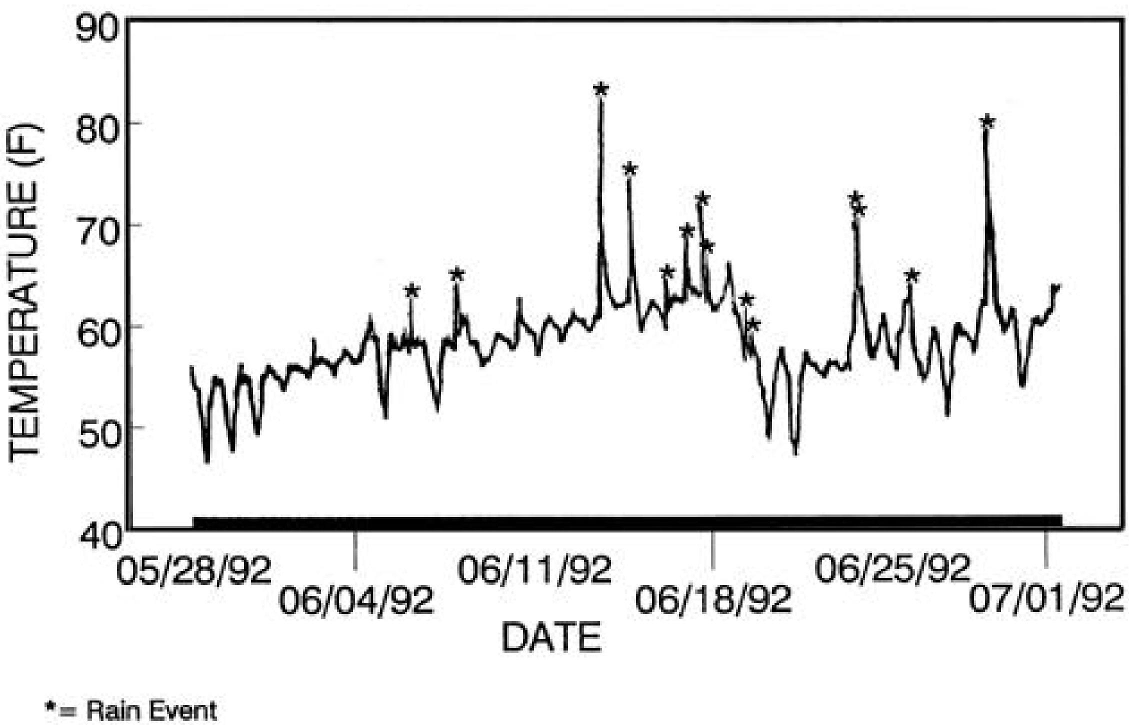


Figure 4 Storm Water Temperatures During Four Rain Events in a Commercial River Falls Subwatershed, June 1992

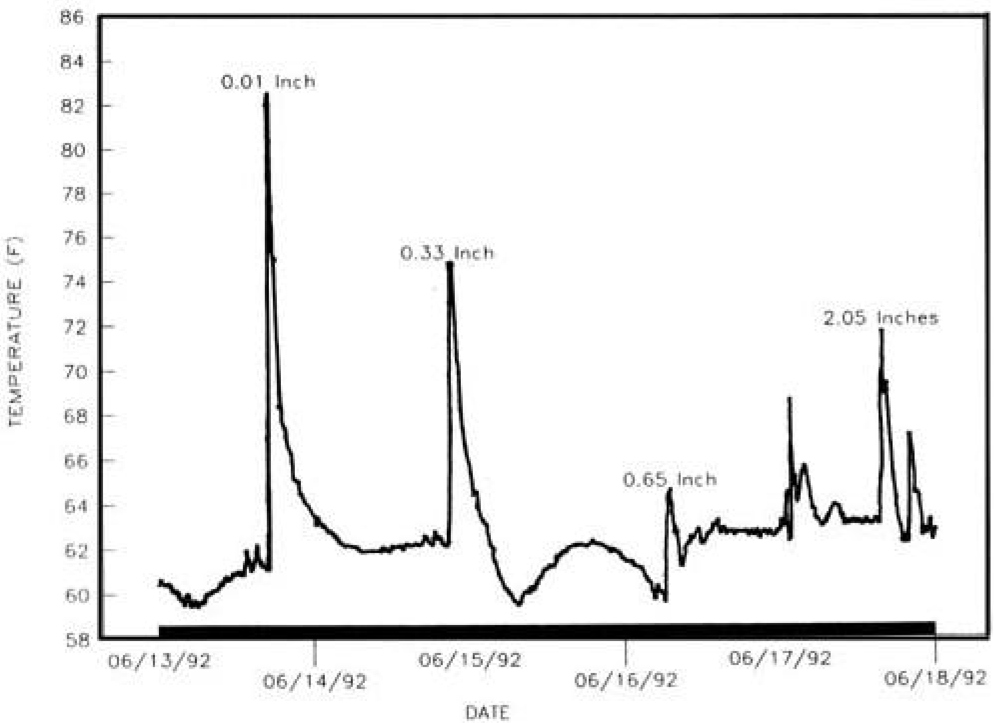


Figure 5 Comparison of Quarry Road, Cedar Street, and Lower Glen Park Thermographs, July 25, 1993

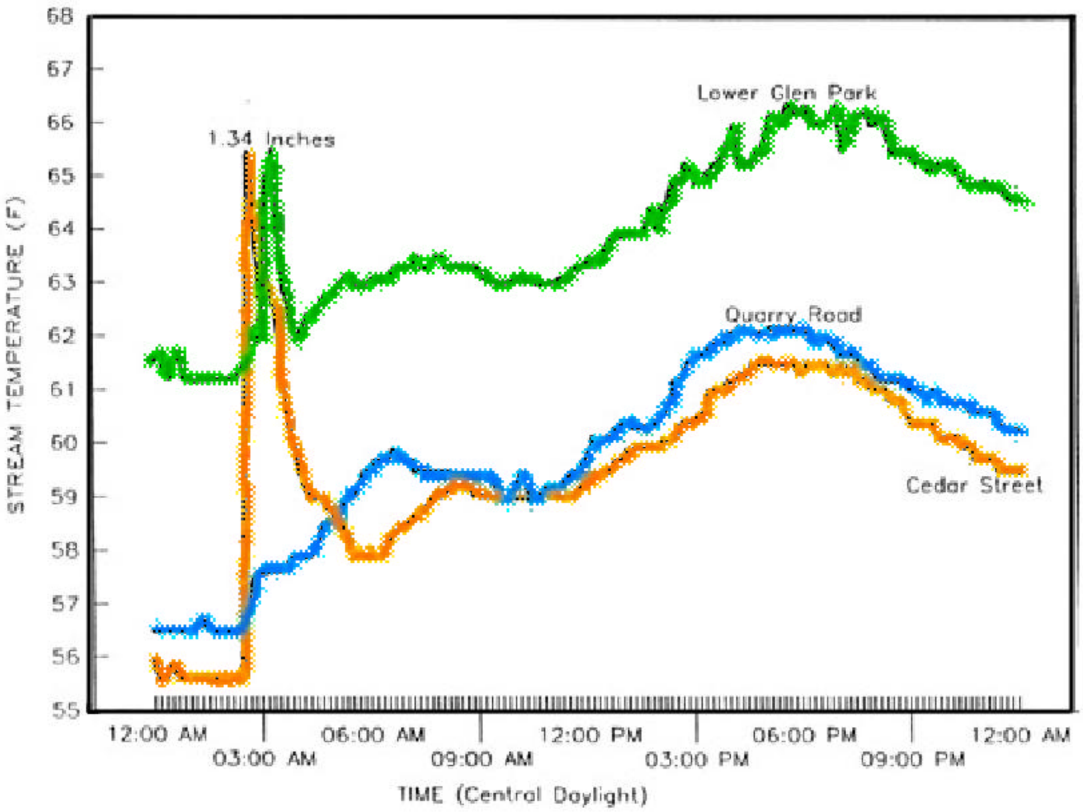


Table 1 River Falls Storm Water Quality (1992) Compared to NURP Monitoring Results

Residential Subwatershed

Water Quality Variable (mg/l)	River Falls Median	NURP Median
TSS (Total Suspended Solids)	240.0	101.0
TKN (Total Nitrogen)	2.6	1.90
TP (Total Phosphorus)	0.75	0.38
Cu (Copper)	0.030	0.033
Pb (Lead)	0.015	0.144
Zn (Zinc)	0.110	0.135

Commercial Subwatershed

Water Quality Variable (mg/l)	River Falls Median	NURP Median
TSS (Total Suspended Solids)	150.0	69.0
TKN (Total Nitrogen)	2.1	1.20
TP (Total Phosphorus)	0.50	0.20
Cu (Copper)	0.030	0.029
Pb (Lead)	0.080	0.104
Zn (Zinc)	0.190	0.226

Industrial Subwatershed

Water Quality Variable (mg/l)	River Falls Median
TSS (Total Suspended Solids)	250.0
TKN (Total Nitrogen)	2.5
TP (Total Phosphorus)	0.50
Cu (Copper)	0.030
Pb (Lead)	0.050
Zn (Zinc)	0.210

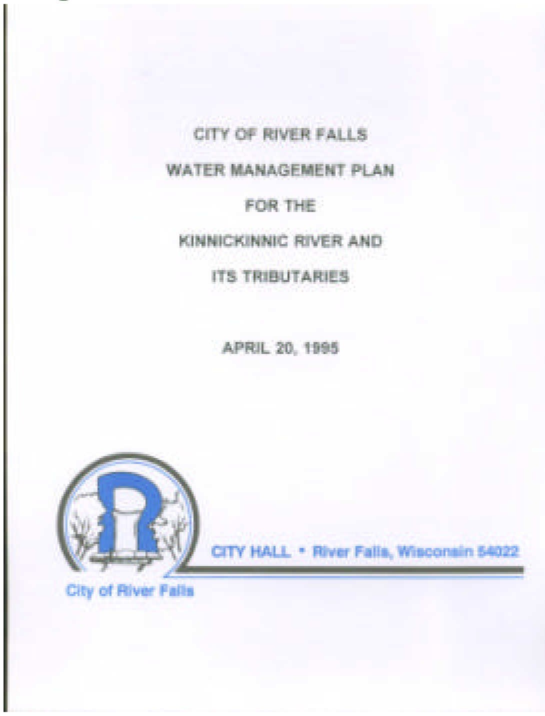
These data represent only one storm event.
No NURP data are available for direct comparison

All Subwatersheds

Water Quality Variable (mg/l)	River Falls Median	NURP Median
TSS (Total Suspended Solids)	200.0	100.0
TKN (Total Nitrogen)	2.6	1.50
TP (Total Phosphorus)	0.50	0.38
Cu (Copper)	0.030	0.034
Pb (Lead)	0.050	0.140*
Zn (Zinc)	0.140	0.160

*NURP monitoring was completed prior to the decrease in leaded gasoline use.

Figure 6



CITY OF RIVER FALLS

WATER MANAGEMENT PLAN

FOR THE

KINNICKINNIC RIVER AND

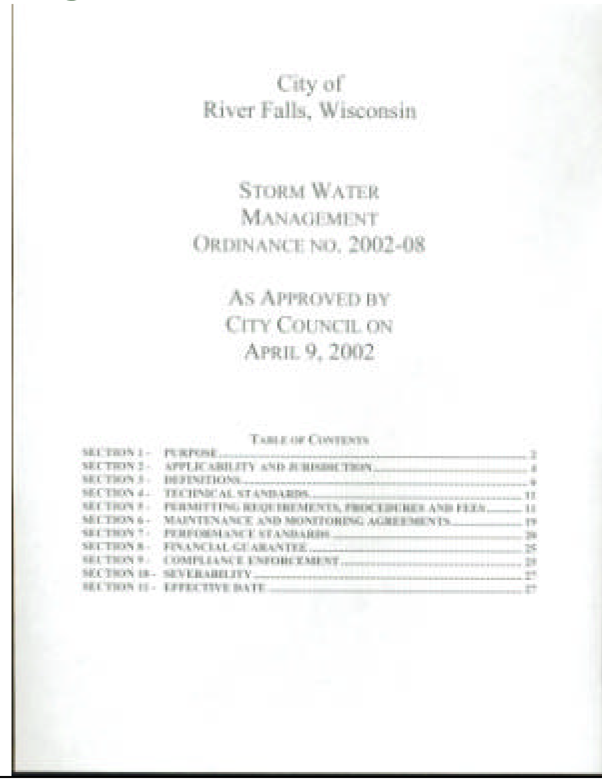
ITS TRIBUTARIES

APRIL 20, 1995

CITY HALL • River Falls, Wisconsin 54022

City of River Falls

Figure 7



City of
River Falls, Wisconsin

STORM WATER
MANAGEMENT
ORDINANCE NO. 2002-08

AS APPROVED BY
CITY COUNCIL ON
APRIL 9, 2002

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Figure 8

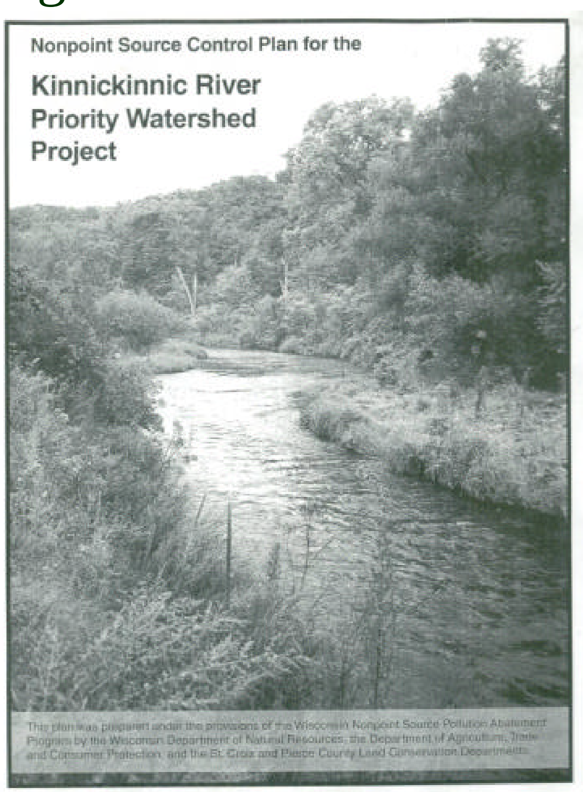


Table 2. Eligible Cost-Shared Agricultural and Urban BMPs

Agricultural BMPs

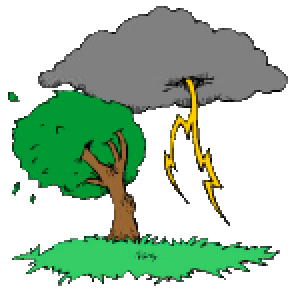
BEST MANAGEMENT PRACTICE	STATE COST-SHARE RATE
Nutrient and Pesticide Management	50%
Pesticide Handling Spill Control Basins	70%
Livestock Exclusion from Woodlots	50%
Intensive Grazing Management	50%
Manure Storage Facilities	70% and 50%
Manure Storage Facility Abandonment	70%
Field Diversions and Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70%
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70%
Shoreline Buffers	70%
Wetland Restoration	70%
Barnyard Runoff Management	70%
Barnyard Abandonment or Relocation	70%
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Milking Center Waste Control	70%
Cattle Mounds	70%
Land Acquisition	70%
Lake Sediment Treatment	70%
Well Abandonment	70%

Urban BMPs

BEST MANAGEMENT PRACTICE	STATE COST-SHARE RATE
Critical Area Stabilization	70%
Grade Stabilization Structures	70%
Streambank Stabilization	70%
Shoreline Buffers	70%
Wetland Restoration	70%
Structural Urban Practices	70%
High Efficiency Street Sweeping	50%, 5 years only

Figure 9

A Storm on the Horizon



A 1999 Chicago International Film Festival Silver Award Winner
Category: Environmental Issues and Concerns

The purpose of the video is to educate the public about the effects of storm water on our lakes, streams and rivers. This educational video discusses the issues surrounding urban development and its impact on water quality. The story of the Kinnickinnic River in western Wisconsin is told, and the prospect for the river's long-term health is discussed. The video is a must see for anyone interested in land use issues and the health of our water resources. The video:

1. Establishes the value of a cold water resource and its importance to the community.

2. Demonstrates the impact of storm water on water resources.

3. Outlines what can be done to enable development to occur while protecting water resources.

Professionally produced by Kiap-TU-Wish and Palisade Productions of Minneapolis, MN, the video is 15 minutes in length and is geared toward educating the general public, land use planners, and decision makers about the impacts of storm water on our water resources.

The video is available for a donation of $15, which includes shipping and handling. To receive the video, please contact us at:

Kent Johnson or Andy Lamberson
Kiap-TU-Wish Chapter of Trout Unlimited
P.O. Box 483
Hudson, WI 54016
Or e-mail us at lamberson@attbi.com

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